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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/911,098 | 07/23/2001 | Kang-Wook Park | 5649-805DV | 4775 |

20792 7590 08/14/2002

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PO BOX 37428
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EXAMINER

FARAHANI, DANA

| | |
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| ART UNIT | PAPER NUMBER |
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2814

DATE MAILED: 08/14/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/911,098

Applicant(s)

PARK, KANG-WOOK

Examiner

Dana Farahani

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 23 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-9,27 and 28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-9,27 and 28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-9, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Japanese Patent 06045342, issued to Kanamori.

Regarding claims 1 and 9, AAPA discloses in figure 1 A bipolar junction transistor (BJT) comprising an intrinsic collector region 13 of a first conductivity type in a semiconductor substrate 10; a trench 19 in the substrate, adjacent the intrinsic collector region; and an emitter region 41 of the first conductivity type that forms a P-N rectifying junction with the base region.

AAPA does not disclose a base electrode of a second conductivity type in a trench, and a base region of the second conductivity type that is self-aligned to the base electrode and forms a P-N rectifying junction with the intrinsic collector region.

The Japanese patent discloses in figure 3 a base region 3 of the second conductivity type and base electrode 5 forms a P-N rectifying junction with the collector region 1. Furthermore, the Japanese patent discloses that this structure reduces the resistance between base and emitter (see the paragraph below the abstract). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention

was made to use the base structure in the Japanese patent in AAPA in order to reduce the resistance between base and emitter.

Regarding claims 2 and 3, AAPA in view of the Japanese patent renders obvious the claimed invention except for a trench-insulating layer disposed between the base electrode 5 and a sidewall of trench 5, in the Japanese patent. It would have been obvious to one of ordinary skill in the art at the time the invention was made to dispose a trench insulating layer between the base electrode and the side wall of the trench in order to limit the bipolar junction transistor operation to the region on top of the trench.

Regarding claims 4 and 6, AAPA discloses in figure 2 base region comprises an extrinsic base region 42 in the extrinsic collector 13; and intrinsic base region 43 of second conductivity type with lower doping than the extrinsic base region in the intrinsic collector region.

Regarding claim 5, AAPA discloses in figure 2 base electrode extension 23 that extends along the surface of the substrate, and emitter region 41 is self-aligned to a sidewall of the base electrode extension.

Regarding claim 7, AAPA discloses in figure 2 an electrically insulating sidewall spacer 29 on the side-wall of the base electrode extension, and an emitter electrode 31 of the first conductivity type on the surface of the substrate and on the electrically insulating side-wall spacer.

Regarding claim 8, AAPA discloses in figure 2 a buried extrinsic collector region 11 of the first conductivity type in the substrate.

Regarding claims 27 and 28, AAPA in view of the Japanese patent discloses the limitation in the claim as above discussed. AAPA further discloses in figure 1 a first electrically insulating layer 25 and a second electrically insulating layer 37 on layer 25 having a lateral recess, as shown in the figure, that extends along an undersurface of the second insulating material.

AAPA in view of the Japanese patent does not disclose an opening in the insulating layers.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to make an opening in the insulating layers in order to be able to contact trench base electrode 5 of the Japanese patent.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dana Farahani whose telephone number is (703)305-1914. The examiner can normally be reached on M-F 8:00AM - 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703)306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9318 for regular communications and (703)872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Application/Control Number: 09/911,098
Art Unit: 2814

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Dana Farahani
August 7, 2002

W. Chandler